Horticulture Series 565

February 1986

CULTURAL RESEARCH WITH PROCESSING TOMATOES 1985

Dale Kretchman, Mark Jameson, and Charles Willer

Department of Horticulture
The Ohio State University
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Studies on culture and physiology of tomatoes for processing were conducted at 2 locations of OARDC—Main Campus, Wooster, and the Vegetable Crops Branch (VCB), Fremont.

Research on the Wooster campus is usually of a preliminary nature and requires frequent observations and data collection. The soil is a Wooster silt loam with good uniformity throughout the experimental area. The plots receive 600 or 700 lbs/A of 10-20-20 fertilizer each year after plowing, but before final fitting for planting. No additional fertilizer was applied except for specific treatments. Metribuzin and chloramben were used for weed control according to standard recommendations. Other pesticides were applied according to recommended practice. No serious problems with weeds, insects or diseases occurred during the study. Further, unless a part of the study, ethephon was applied to all plots according to standard recommendations. Rainfall and temperature data are summarized in Table 1.

Soil at VCB ranges from a sandy loam to a clay loam and every effort is made to have maximum uniformity within a particular study. The clay loam soil is fall bedded using a power bedder. The sandy soil is bedded in the spring prior to planting. The beds are on 60-inch centers with 48-inch tops and furrows 6-8 inches deep. The P & K fertilizer is applied after plowing in the fall or spring, but before bed formation. Nitrogen is applied in the spring immediately prior to planting and usually incorporated 1-2 inches deep at the same time as the herbicide incorporation. The herbicides used were napropamide (Devrinol) and/or metribuzin (Sencor or Lexone) at recommended rates. Insecticides and fungicides were also used according to standard recommendations. Generally, no serious weed, insect or disease problems occurred, although bacterial speck and/or spot was evident in one study. Ethephon at 3 pts/A was applied to all plots at the mature-green stage of fruit development.

Generally, plot rows were 30 ft. long at both locations and plants are spaced 12 in. apart where single rows are used. Beds were used at the VCB, but not at Wooster, but single rows were on 5-ft. centers at both locations. Additional specific details are given with each study.

Special Note: This is to gratefully acknowledge the support in the form of monetary gifts from The Ohio Food Processors Association and the Fremont Pickle and Tomato Growers Association.

S-444/2-86/200

TABLE 1. Temperature and Rainfall Data

	Temperature (°)						Rainfall (in.)	
	1985 Means			Long Term Means				
Month	Min.	Max.	Avg.	Min.	Max.	Avg.	1985	Long Term Avg.
				Wooster				
April	40.5	63.8	52.1	36.9	59.4	48.1	1.01	3.15
May	48.5	70.4	59.4	46.4	70.4	58.4	6.12	3.89
June	51.6	71.9	61.8	55.5	79.2	67.4	3.31	3.86
July	59.2	80.0	69.6	59.5	83.3	71.4	4.15	3.96
August	58.1	76.6	67.4	57.8	81.9	69.6	4.64	3.57
Sept.	51.1	74.1	62.6	51.5	75.7	63.3	1.31	3.07
				VCB				
April	42.7	67.0	54.9	38.2	58.3	48.3	0.96	3.11
May	50.2	74.0	62.1	48.1	69.5	58.8	3.63	3.46
June	54.7	75.1	64.9	57.6	78.6	68.1	1.96	3.95
July	60.4	82.0	71.2	61.8	82.8	72.3	2.69	3.97
August	57.6	78.7	68.1	59.6	80.9	70.3	3.79	3.52
Sept.	52.5	75.9	64.2	53.0	74.9	63.9	0.96	2.94

A. Stand Establishment Studies - Transplant Quality:

1. Pre-Cooling of Transplants in Georgia

Pre-cooling of transplants to remove the field heat prior to placing in refrigerated trucks has not been studied recently. This work was done in cooperation with L.A. Risse, USDA-ARS, Orlando, FL. Plants were harvested in Georgia and immediately taken to the laboratory at Tifton, placed in a chamber and forced-air pre-cooled to near 50°F. Then they were placed into a refrigerated trailer-truck and sent to Fremont (H.J. Heinz Co.). Two shipments were made, May 16 and 24. There were control plants with each shipment that were not pre-cooled.

Upon arrival, plant samples were taken for determining fresh and dry weights and soluble solids in juice extracted from the plant stems. Some plants were planted immediately and others stored for 5 days in the cool garage at the VCB. Plant samples were also taken from these stored plants for fresh and dry weights and soluble solids data.

Stand counts were made about 2 weeks after planting and final yield data taken at maturity from the mechanical harvest of the plots.

The plants were received in generally good condition, but the plants which were pre-cooled appeared slightly more wilted than the non-pre-cooled plants. No other differences were apparent.

Results (Table 2) indicate that pre-cooling plants had no significant effect on plant survival or yield if planted immediately. However, the pre-cooled plants did not survive as well after storage for 5 days. The yields also are a reflection of stand count.

TABLE 2. Influence of pre-cooling transplants on stand and yield.

Treatment			Plant Data					Yield T/A		
Planting date	Precooled	Stored (days)	Fr.Wt. (gms/pl)	Dry Wt. (gms/pl)	Dry Wt. (%)	Sugars (%)	Stand (%)	Ripe	Green	Total
5-16	Yes	0	5.36	0.47	8.7	3.0	94	34.4	5.4	39.8
	Yes	5	7.62	0.86	11.1	3.3	15	6.5	3.9	10.4
	No	0	6.72	0.63	9.8	3.7	95	34.0	5.2	39.2
	No	5	7.62	0.79	11.5	4.2	25	10.2	8.2	18.4
5-24	Yes	0	7.09	0.96	13.4	5.8	100	38.0	3.9	41.9
	Yes	5	3.27	0.40	12.2	2.5	8	3.2	2.3	5.5
	No	0	7.06	0.96	13.5	4.2	97	37.4	3.4	40.8
	No	5	3.48	0.34	9.4	5.1	59	26.5	8.5	35.0
LSD 5% =			1.43	0.30	3.4	0.7	—	4.3	2.5	6.1

2. Plant Storage and Quality

Predicting the storability of transplants would be very helpful for grower and processor to decide if plants can be stored during inclement weather or if plants should be discarded and fresh plants used for planting. Previous work suggested that soluble solids in the juice extracted from the transplant stems could at times indicate storability. Other data indicates that dry matter accumulation would be a better indicator. This study was conducted to gather data to develop a method for predicting storability.

This study was conducted at the VCB with plants received from the H.J. Heinz Co. Heinz also supplied the refrigerated storage for one of the storage treatments. Plants were received on 2 dates—May 3 and May 31. Two varieties, H-722 and FM 6203, were subjected to the following treatments: planted immediately and stored 2, 4, or 6 days in either refrigerated storage (45-50^{o}F) or a cool shed at the VCB.

Data collected were plant fresh and dry weights, soluble solids in the liquid extracted from the plant stems, stand count 2 weeks after planting and final yield from a mechanical harvest. Results in Table 3 indicate that, 1) refrigerated storage may be no better for storage of tomato transplants than a cool barn or other equipment shed, 2) storing tomato transplants longer than 2 days may result in unacceptable stands, 3) plant quality measurements had no apparent relationship to plant survival and yield, 4) yield was closely associated with stand, although even poor stands yielded unexpectedly well.

More work is needed in this area of study with additional quality factors measured.

TABLE 3. Influence of plant storage on plant quality, survivability, and subsequent yield.

Date Plants received	Storage # Days	Storage Conditions	Fr.Wt. gm/pl	Plant Sample Dry Wt. gm/pl	Plant Sample Dry Wt. (%)	Soluble Solids (%)	Plant survival (%)	Ripe Yield T/A
			Variety H-722					
5-9	0	—	7.58	1.07	14.1	4.7	89.2	29.4
	2	Ref.45-50°F	5.35	.89	16.8	6.2	80.0	27.4
	4	Ref.45-50°F	4.66	.71	15.2	5.3	65.8	25.2
	6	Ref.45-50°F	4.16	.63	14.3	5.0	35.8	19.2
	2	Cool Shed	6.40	.67	9.6	6.0	70.0	26.5
	4	Cool Shed	5.42	1.12	20.7	7.0	69.0	30.6
	6	Cool Shed	2.85	.84	30.0	6.2	42.5	11.7
			Variety FM 6203					
	0	—	6.25	.81	12.9	2.7	91.7	30.5
	2	Ref.45-50°F	7.28	1.00	13.7	2.8	95.0	28.0
	4	Ref.45-50°F	4.52	.62	14.5	4.9	59.2	22.2
	6	Ref.45-50°F	4.55	.67	14.2	9.3	28.3	17.0
	2	Cool Shed	7.20	.92	12.8	2.6	66.7	24.5
	4	Cool Shed	6.11	.82	13.4	4.7	70.8	26.7
	6	Cool Shed	6.16	.85	13.8	4.5	56.7	19.1
			Variety H-722					
5-31	0	—	6.14	.61	9.7	3.6	100	28.9
	2	Ref.45-50°F	5.56	.58	9.8	4.3	100	25.9
	4	Ref.45-50°F	5.43	.51	9.3	2.5	91.7	30.1
	6	Ref.45-50°F	4.72	.63	13.4	3.0	38.3	20.3
	2	Cool Shed	5.39	.61	11.5	3.8	100	31.3
	4	Cool Shed	5.08	.77	15.0	4.7	22.5	18.5
	6	Cool Shed	4.33	.50	11.5	2.7	9.2	14.4
			Variety FM 6203					
	0	—	5.03	.57	11.4	4.5	99.2	32.6
	2	Ref.45-50°F	4.66	.48	10.4	4.0	97.5	33.4
	4	Ref.45-50°F	5.21	.58	11.1	3.7	50.8	24.8
	6	Ref.45-50°F	5.21	.73	14.0	3.0	32.5	20.5
	2	Cool Shed	4.77	.53	10.7	4.8	94.2	29.0
	4	Cool Shed	4.39	.54	12.2	3.3	21.7	12.4
	6	Cool Shed	3.32	.61	18.1	4.2	10.0	14.1
LSD 5%			1.76	.34	4.79	1.8	19.1	10.3

3. Fruit Removal Studies

This experiment involved the influence of small fruits on transplants and the timing of their removal on subsequent plant development and yield.

Plants of variety Hyb. 6129 were received on May 31, 1985, and it appeared that many plants had small fruits on them. Nine boxes were received and the plants were sorted so that sufficient plants with fruits present could be used for the planting. However, slightly over 600 plants were available and this was enough plants for only 2 replications of the experiment. It was obvious from this sorting that appearance is deceiving and what appears as many plants with fruits present may be less than 10% with fruits present.

The plants were planted the same day as received. The plants for the control plots were from the same lot of plants, but had no fruits present when planted. The fruit removal treatments and yield results are given in Table 4.

Results from this limited trial suggest that fruits on plants at transplanting result in delayed maturity of the fruits. Further, fruits must be removed prior to planting if this maturity delay is to be prevented.

This study needs to be repeated with more than 2 replications of 2 or more varieties to more precisely establish these apparent effects of fruits or plants.

TABLE 4. Influence of fruit on transplants on maturity and yield.

	Yield						
	Ripe		Green		Rots		Total
Treatment	T/A	%	T/A	%	T/A	%	T/A
Control-No fruits present	39.3	78.9	4.3	8.5	6.3	12.6	43.6
Fruits removed before planting	38.4	77.2	4.8	9.6	6.6	13.2	43.2
Fruits on all plants-none removed	31.0	70.3	7.5	17.0	5.5	12.7	38.5
Fruits removed 1 week after planting	32.7	73.8	6.5	14.5	5.1	11.7	39.2
Fruits removed 2 weeks after planting	34.0	72.7	7.4	15.9	5.4	11.4	41.4
Fruits removed 3 weeks after planting	33.0	73.9	7.4	16.6	4.2	9.5	40.4
Fruits removed 4 weeks after planting	29.7	67.5	8.9	20.4	5.3	12.1	38.6
Fruits removed 6 weeks after planting	36.4	76.3	7.8	16.3	3.5	7.4	44.2
Fruits removed from 25% of plants 2 weeks after planting	34.0	71.8	8.0	16.8	5.3	11.4	42.0
Fruits removed from 50% of plants 2 weeks after planting	33.6	72.0	9.4	20.3	3.5	7.7	43.0
Fruits removed from 75% of plants 2 weeks after planting	34.5	75.4	7.1	15.4	4.1	9.2	41.6
LSD 5%	ns	ns	2.2	4.3	ns	ns	ns

B. Fertiizer Studies

1. Potassium Placement:

Past research has clearly demonstrated that many of the new, high yielding, machine-harvestable varieties do not contain desirable levels of K in the plants during rapid fruit enlargement and ripening. This study was designed to determine if placement of K in the soil had any influence on K in the plant, fruit quality and yield.

Treatments included pre-plant and post-plant broadcast, as well as drilling on each side of the row after planting (Table 5). The source of K was K_2SO4. H-722 was the variety planted on May 23. Plots were on fall-bedded, clay-loam soil. All fertilizer and pesticide treatments were uniform throughout the experiment.

Results (Table 5) indicate that no method of application or timing improved yield or fruit quality. However, yield was reduced from the treatment of 200 lb/A of K_2O drilled 6 in. each side of the row immediately after transplanting. This rate of fertilizer applied that close to the root system apparently caused some root injury. Leaf analyses for K in the foliage from the treatments have not been completed and thus, are not included in this report.

TABLE 5. Influence of K placement on yield and fruit quality.

Treatment K_2O (lb/A)	Appl.* Method	Yield (Tons/A) Ripe	Green	Fruit Quality** Soluble solids	pH	Acid %	Color
200	ppbi	30.8	3.7	4.4	4.28	4.4	85.0
100+100	ppbi+6" drill	32.7	5.3	4.4	4.34	4.2	83.7
100+100	ppbi+postpbi	30.3	3.3	4.9	4.27	4.6	84.4
200	6" drill at planting	27.1	5.0	4.2	4.23	4.3	82.8
200	12" drill 4 wks. post pl	29.3	4.3	4.7	4.26	4.6	85.6
200+100 +100	ppbi+4 weeks +8 wks postpbi	30.6	4.7	4.6	4.29	4.6	85.9
LSD 5%		3.2	—	—	—	—	—

* ppbi = pre-plant broadcast incorporated; 6" drill applied = 6" to each side of row about 4 inches deep; post pl.=post planting

**Color measured by Hunter colorimeter, higher readings indicate more red color.

2. Potassium Source:

Three sources of K were used in the study; KNO_3, K_2SO_4, and KCl. Application rates were 300 lbs/A of K_2O applied pre-plant broadcast on fall-bedded clay loam soil. Nitrogen was adjusted to provide a uniform supply of N. Variety was H-722 planted in May 24. Plots were harvested by machine on September 17, 1985.

Results (Table 6) indicate that the sources had no influence on yield or maturity. Leaf analyses data are not yet available. Fruit quality data also indicate that K source had no influence on the factors evaluated.

3. Rate of Potassium Nitrate:

Greenhouse studies conducted at OARDC in the 1960's suggested a relationship of N as affecting K uptake into the plants. Therefore, a preliminary field trial was conducted to see if any leads could be generated from using a dual source of N and K on processing tomato yield and quality.

The source was KNO_3 and treatments are given in Table 7. The fertilizer was applied broadcast in the spring to fall beds and incorporated about 2 inches deep immediately prior to transplanting. Planting of variety H-722 was done on May 24. All other cultural practices were standard and the plots were machine harvested on September 17, 1985.

Results (Table 7) indicate that the treatments had no significant influence on yield or fruit quality. Leaf analyses results are not yet available.

TABLE 6. Influence of K source on yield and fruit quality.

	Yield (T/A)		Fruit Quality			
K Source	Ripe	Green	S.Solids	pH	Acid (%)	Color
KNO_3	33.4	3.8	4.2	4.34	4.05	83.3
K_2SO_4	34.6	4.6	4.2	4.29	4.10	82.5
KCl	33.2	4.2	4.1	4.35	4.15	84.0

TABLE 7. Influence of rates of KNO_3 on yield and fruit quality.

Lbs/A		Yield (T/A)		Fruit Quality			
N	K_2O	Ripe	Green	S.Solids	pH	Acid (%)	Color
0	0	30.7	3.6	4.5	4.26	4.25	83.2
50	170	33.2	4.6	4.4	4.26	4.40	86.9
100	338	32.8	5.7	4.4	4.25	4.70	83.4
150	507	33.6	6.4	4.6	4.23	4.70	85.6

4. Study To Determine If Twin Rows Require Higher Rates of N Fertilizer Than Single Rows.

This study was initiated with 4 treatments, 0, 50, 100, 150 lbs/A of N (from ammonium nitrate) with 2 varieties, H-722 and FM-6203. Treatments were applied to fall beds, immediately prior to transplanting and incorporated. Beds were on 5 ft. centers and single rows had plants spaced 10 in. apart; twin rows were 18 in. apart on the beds with 20 in. between plants giving the same plant populations. Planting was done on May 24 and 25 and plots were harvested by machine on September 17.

Results (Table 8) indicate that H-722 did have increased yields from twin rows but FM-6203 did not. There was no indication that yields were increased any more in twin rows from increased increments of N than in single rows. The data do indicate that increased rates of N do delay maturity in both single and twin rows.

TABLE 8. Relationship of rate of N and variety to maturity and yield of single and twin rows.

		Yield T/A				Maturity (%)			
		Ripe		Green		Ripe		Green	
N lbs/A	Variety	S*	T	S	T	S	T	S	T
0	H-711	28.1	33.6	2.5	1.8	78.1	81.7	6.6	4.3
50		31.2	37.6	2.6	2.4	79.1	81.4	6.4	5.1
100		34.8	40.1	3.6	2.0	80.7	84.6	8.1	4.2
150		34.2	41.2	4.1	4.9	80.2	80.6	9.7	9.8
LSD 5%		6.0		1.8		NS		5.3	
0	FM-6203	27.5	25.5	6.4	4.1	78.2	82.4	17.9	13.8
50		29.7	28.4	7.1	6.6	79.1	78.6	18.7	18.7
100		28.6	30.5	8.7	7.2	74.8	77.9	22.9	19.7
150		29.3	28.1	9.0	8.3	74.6	75.2	23.2	22.2
LSD 5%		6.0		1.8		NS		5.3	

* S=single rows; T= twin rows

5. Timing and Placement of N for Newer Varieties of Tomatoes

This study was designed to obtain some preliminary information on the newer hybrids of tomatoes, primarily if they will respond to an early side-dressing of N from ammonium nitrate. The treatments and varieties are listed in Table 9. Included in the study were drilled treatments vs. broadcast treatments. The plants were transplanted on May 15 (O-832) and May 20 for the other 3 varieties. Single and twin-row spacings were the same as the previous single-twin row studies. The plots were machine harvested on August 20 to August 28 depending upon variety (H-2653 earliest followed closely by Hyb. 1 & 2 and then O-832).

Results (Table 9) indicate that in 1985, none of the varieties responded to a side-dress of N fertilizer made 3 weeks after transplanting. Furthermore, drilling to the side of each row made no apparent difference in yield response. The data also show that H-2653 was the only variety that responded favorably to twin-row culture.

TABLE 9. Relation of variety to N placement and timing as influencing yield on single and twin rows.

Treatment		Ripe Yield (Tons/A)							
		O-832		H-2653		Hyb-1		Hyb-2	
N (lbs/A)	Appl. Method	S	T	S	T	S	T	S	T
75	ppb	29.8	31.3	21.9	27.4	26.5	26.0	21.6	23.0
50+25	ppb + 3 wks post b.	30.7	31.6	20.1	26.8	24.8	26.6	21.8	23.5
75	pre-plant drill 6" each side of row	31.2	32.4	20.0	27.1	25.5	25.2	22.4	24.0
50+25	ppb + 3 wks post drill 12 in. each side of row	29.8	21.9	21.5	27.6	25.1	28.2	22.9	20.9
LSD 5%				3. 0					

ppb = pre-plant broadcast and incorporated about 2 in. deep.
3 weeks post b. = broadcast and incorporated 3 weeks after planting
drill treatments were made either 6 in. or 12 in. each side of row 2 in. deep.

6. Greenhouse Study On The Influence of K and Ca On Ripening Disorders

This study was done in sand culture with modified nutrient solutions to obtain some preliminary data on the relationships of K and Ca to ripening disorders, especially blotchy ripening. The experiment was done in the greenhouse in the summer, which is not the best time to conduct an experiment, but the heat and light stresses provided optimum conditions for obtaining treatment response.

Treatments were: 1) control (complete nutrient solution); 2) 50% K and 150% Ca; 3) 150% K and 50% Ca. The nutrients were mixed into deionized water and applied each time water was needed by the plants. The treatments were replicated 3 times with single plants in standard 12-inch pots. The variety was H-722. Leaf samples were collected monthly for analyses (data not yet available). Fruits were harvested once when 90+% were ripe and evaluated for "Blossom-end Rot" and "Blotchy ripening".

Results in Table 10 clearly show the influence of K deficiency on blotchy ripening and of Ca deficiency on blossom-end rot.

TABLE 10. Influence of K and Ca nutrition on ripening disorders of H-722 tomatoes.

Treatment	Blossom-end rot (%)	Blotchy Ripening (%)
Control	4.82	1.15
50% K + 150% Ca	3.33	25.64
150% K + 50% Ca	12.44	0.23

C. Growth Regulator Trials

1. "Respond" ('Reward' prior to 1985) a mixture of compounds reported to have beneficial effects to several fruiting crops, was studied on tomatoes at the VCB and at Wooster. The compound was used as both a spray and root dip. Treatments and yield results are given in Table 11. Foliar treatments were applied with a CO_2 pressurized hand-sprayer in water at a rate of 60 gpa. Treatment Time 1 was when blossom buds were first visible, but no flowers open (June 21 at VCB and June 25 at Wooster); Time 2 was near full bloom (July 10 at VCB and July 9 at Wooster). The root dip was a wetting submersion of the root system immediately prior to planting.

   The variety used was H-722 transplanted on May 23 at Wooster and May 24 at VCB. Treatments were replicated 4 times at each location. Harvest was done by machine at VCB and by hand at Wooster.

TABLE 11. Influence of treatment with "Respond" on yield of tomatoes--OSU/OARDC.

Treatment			Yield Ripe T/A	%	Green T/A	%	Rotten T/A	%	Total T/A
			Vegetable Crops Branch						
Foliar	Time*	Root Dip							
0		0 (check)	34.2	89.5	1.6	4.0	2.4	6.5	35.8
1 pt	1	0	34.5	87.5	2.7	6.8	2.2	5.7	37.3
1.5 pt	1	0	32.5	87.9	1.5	4.3	2.8	7.8	34.0
1 pt	2	0	34.0	87.3	2.1	5.5	2.7	7.2	36.1
1.5 pt	2	0	33.9	88.6	1.6	4.2	2.7	7.2	35.5
0		1%	38.5	87.9	2.4	5.5	2.8	6.6	40.9
1 pt	1	1%	33.8	88.9	1.2	3.0	2.9	8.1	35.0
1.5 pt	1	1%	34.6	88.4	2.1	5.3	2.4	6.3	36.7
1 pt	2	1%	33.8	88.3	2.2	5.9	2.2	5.8	36.0
1.5 pt	2	1%	33.7	89.3	1.9	4.7	2.2	6.0	35.6
LSD 5%			ns	ns	ns	ns	ns	1.6	ns

Treatment			Yield Ripe T/A	%	Breakers T/A	%	Green T/A	%	Rotten T/A	%	Total T/A
			Wooster								
Foliar	Time*	Root Dip									
0		0 (check)	24.4	53.4	8.6	18.6	11.0	23.9	1.9	4.1	44.0
1 pt	1	0	23.9	49.1	9.9	20.3	13.0	26.5	1.9	4.1	46.8
1.5 pt	1	0	21.5	47.5	8.6	18.2	14.4	30.0	1.6	3.6	44.5
1 pt	2	0	24.1	52.9	6.5	14.0	14.0	29.4	1.8	3.7	44.6
1.5 pt	2	0	24.0	50.7	11.4	23.3	11.3	22.8	1.5	3.2	46.7
0		1%	23.1	52.3	7.8	17.4	12.2	27.3	1.3	3.0	43.1
1 pt	1	1%	25.5	52.6	7.7	15.3	14.7	28.5	1.8	3.6	47.9
1.5 pt	1	1%	22.2	42.1	10.5	19.5	19.5	35.7	1.5	2.7	52.2
1 pt	2	1%	25.3	52.3	9.1	18.5	12.8	25.9	1.7	3.3	47.2
1.5 pt	2	1%	23.9	48.4	9.3	18.6	14.5	29.0	2.1	4.0	47.7
LSD 5%			ns	ns	ns	ns	ns	ns	ns	ns	ns

*Time 1 = flower buds first visible but no flowers open
Time 2 = full bloom

2. Influence of Growth Inhibitors on Fruiting of Tomatoes

Transplants of O-7870 were planted on May 23, 1985, at the main campus of OARDC in Wooster. Treatments were applied at or near full bloom on 7-16-85, 2:00 p.m., sunny and 78°F: 1) check (unsprayed); 2) Alar 2500 ppm; 3) EL500 50 ppm; 4) RSW 0411 1000 ppm. The materials were applied as a water spray at 60 gpa using a hand-held 2-nozzle boom mounted on a CO_2 sprayer. The plots were harvested as a single harvest on 9-10-85. All treatments were replicated 3 times on 30 ft. rows.

Results (Table 12) suggest that the growth inhibitors did improve maturation. However, no differences are statistically significant and thus, these results appear to be strictly by chance and not due to treatment. It does appear that this experiment is worthy of repeating.

TABLE 12. Influence of growth inhibitors on yield and maturity of O-7870 tomatoes.

	Yield - Ripe		Green	
Treatment	T/A	%	T/A	%
Check	33.5	67.2	14.2	28.5
Alar	33.9	72.7	10.6	22.6
EL-500	34.5	73.2	10.2	22.0
RSW-0411	35.1	73.9	10.5	21.8

3. Influence of Growth Regulators on Maturity and Yield

A preliminary trial was conducted to determine the effects of several growth regulators on plant growth and development, maturity and yield. The study was conducted at the main campus on O-7870 transplants, 30 ft. rows and 3 or 4 replications. The treatments were applied with the same equipment as the previous experiment.

Treatments and results are given in Table 13. It appears that none of the chemicals had any significant effect on fruit maturity or yield. Field observations suggested that GA_3 treatments increased plant growth but this was not translated into greater yields. No differences in plant growth were apparent from the other treatments.

4. A companion preliminary trial was done to determine the effects of 6-benzyladenine (6BA) on post-harvest fruit quality. Results suggest that the several treatments with this chemical had no significant influence on fruit soluble solids, pH and titratable acids for up to 12 days after harvest.

TABLE 13. Influence of plant growth regulators on yield of O-7870 tomatoes.

Treatment	Yield-Ripe T/A	Yield-Ripe %	Green T/A	Green %
Check	37.6	70.7	14.5	26.2
50 ppm GA_3 first bloom	34.5	66.5	16.1	30.2
50 ppm GA_3 first bloom and full bloom	37.1	70.8	13.6	24.8
50 ppm GA_3 full bloom	36.5	77.0	9.3	19.1
50 ppm Promalin first bloom	34.1	70.4	12.3	25.3
50 ppm Promalin first bloom and full bloom	36.6	72.4	12.6	24.7
50 ppm Promalin full bloom	37.7	78.8	8.4	17.7
50 ppm 6BA first bloom	39.1	74.3	11.4	21.5
50 ppm 6BA first bloom and full bloom	34.9	69.0	13.7	26.6
50 ppm 6BA full bloom	36.3	64.6	16.8	29.9

Promalin = N-(phenylmethyl)-1 H-purine-6-amine + GA_{4+7}

D. Fruit Quality - Plant Undercutting

A study was conducted to determine the influence of undercutting plants on efficiency of fruit removal from mechanical harvest and on fruit quality.

Plots were established with transplants of H-722 on May 20, and with FM 6203 on May 23. The soil was a sandy loam and bedded in the spring prior to planting. Single-row plots were used. The plants were undercut with a flat blade attached to a 3-point hitch and run about 1-inch deep. It was quite effective in cutting off the plants without significantly moving the plant. The undercutting was done on August 26 for FM 6203 and September 8 for H-722. The plots were then harvested by machine 1, 2, 3, 4, and 5 days after undercutting and these data were compared to plots where plants were not undercut. In addition to the fruits harvested by the harvester, fruits were also picked-up by hand to determine the amount of fruits left by the harvester.

Results given in Table 14 indicate that undercutting had no significant effect on yield of ripe fruits. The longer the delay between undercutting and harvest appeared to reduce the amount of green fruits, but also increased the amount of rots. The undercutting had no apparent influence on recovery with these 2 varieties.

Results from the fruit quality analyses (Table 15) do not give a clear picture of the influence of undercutting on fruit quality. It appears that the loss of water by the fruit from undercutting has a significant influence on the quality readings. Further, obtaining a representative sample appears more critical than originally thought.

TABLE 14. Influence of undercutting on yield of tomatoes.

Treatment (days undercut to harvest)	Ripe T/A	Ripe %	Green T/A	Green %	Rots T/A	Rots %	Drops T/A	Drops %
FM 6203								
Check (0)	36.5	92.2	0.8	2.3	1.1	2.7	1.1	2.8
1	38.2	92.4	1.8	4.3	0.7	1.6	0.6	1.7
2	36.1	89.2	1.9	4.8	1.0	2.5	1.3	3.5
3	38.8	91.6	1.3	3.0	1.0	2.4	1.2	3.0
4	36.0	91.3	0.6	1.5	1.9	4.8	0.9	2.4
5	36.0	87.9	0.1	0.3	3.1	7.6	1.7	4.2
H-722								
Check (0)	38.3	88.6	1.7	3.9	2.4	5.7	0.8	1.8
1	37.1	87.1	1.9	4.3	2.6	6.0	1.0	2.6
2	35.1	86.6	1.3	3.3	3.2	7.9	0.9	2.5
3	35.2	86.7	0.9	2.1	3.5	8.8	0.9	2.4
4	38.4	89.0	1.2	2.7	3.0	6.9	0.6	1.4
5	35.6	87.3	1.1	2.7	2.5	6.1	1.5	3.9
LSD 5%	ns	3.1	0.8	1.9	0.8	1.9	0.8	1.8

TABLE 15. Influence of undercutting on fruit quality of FM 6203 and H-722 tomatoes.

Treatment Days Undercut	Changes from check data: Soluble Solids	pH	Total Acids
1	-.113	+.033	-.200
2	-.238	-.010	+.137
3	+.150	-.008	-.137
4	+.063	+.036	+.019
5	-.025	+.058	+.338
LSD 5%	ns	.063	.324

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SUPPLEMENT TO HORTICULTURE SERIES 565, Feb. 1986

Dale Kretchman, Mark Jameson, and Charles Willer

Potassium Nutrition of Processing Tomatoes: Leaf analysis data for the studies on pages 7, 8 and 11 were not available at the time of writing the original publication. These data are now available and presented in this supplement.

1. Potassium Placement and Timing of Application: The treatments and leaf analysis results are given in Table 1. It is very obvious from these data that the amount of K in the leaves drops dramatically during fruit growth and development. Data also indicate that side-dressing bands of K fertilizer does not result in an increase in K in the leaves, even when amounts sufficient to cause plant injury and reduced yields is banded close to the plant roots.

TABLE 1. Influence of time of application and placement of K fertilizer on K content of leaves and ripe fruit yield of H-722 tomatoes, 1985.

Treatment (lbs/acre K_2O)	Leaf Content (%K) Sample date 7-11	7-26	8-12	Yield (ripe)* tons/A
200 lbs pre-plant broadcast & incorp.	2.15	2.04	1.01	30.8
100 lbs pre-plant broadcast & incorp. + 100 lbs drilled 6 in. each side of row at planting	2.26	1.85	0.84	32.7
100 lbs pre-plant broadcast & incorp. + 100 lbs broadcast & incorp. 4 wks after planting	2.32	2.54	0.94	30.3
200 lbs drilled 6 in. each side of row at planting	2.26	1.62	1.15	27.1
200 lbs drilled 12 in. each side of row 4 wks after transplanting	1.71	1.37	0.93	29.3
200 lbs pre-plant broadcast & incorp. + 100 lbs broadcast & incorp. 4 wks after planting + 100 lbs broadcast & incorp. 8 wks after planting	2.54	1.88	1.23	30.6
LSD 5%		0.91		3.2

*Harvested 9/18/85

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2. Potassium Source: Three sources of potassium were evaluated for effect on tomatoes. Rates were 300 lbs. per acre of K_2O applied in the spring, pre-plant broadcast and incorporated on fall-prepared beds. Results summarized in Table 2 indicate that source had no influence on the amount of K in the leaves. Further, as with the previous experiment, the levels of K in the leaves declined significantly during rapid fruit enlargement.

TABLE 2. Influence of source of K on K content of leaves and yield of ripe fruit of H-722 tomatoes, 1985.

Source of K*	Leaf Content (% K) 7-26	8-12	Yield (ripe)** tons/A
Potassium nitrate	2.11	1.25	33.4
Potassium sulfate	2.21	1.08	34.6
Potassium chloride	1.94	1.05	33.2

* All applied at rate of 300 lbs/A K_2O pre-plant broadcast.
**Harvested on 9-17-85

3. Rate of Potassium Nitrate: This fertilizer is one means of supplying both N and K and at varying rates in a preliminary field experiment. Data indicates that the rates used (Table 3) influenced the levels of K in the leaves to some extent; there was considerable variability. It is quite likely that the varying rates of N confounded the results. A subsequent experiment is in progress in 1986 to more adequately determine the nitrogen rate relationship.

TABLE 3. Influence of rate of potassium nitrate on K content of leaves and ripe fruit yield of H-722 tomatoes, 1985.

Lbs/Acre N	K_2O	Leaf Content (% K) 7-11	7-26	8-12	Yield (ripe) tons/A
0	0	2.36	1.55	1.15	30.7
50	170	2.19	1.51	1.36	33.2
100	338	2.79	1.49	1.99	32.8
150	507	2.38	1.92	1.65	33.6
	LSD 5%		0.45		NS

Harvested 9-17-85

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4. Varietal Relationships to K Content: Two varieties were used in some of the above experiments, but data are presented from only H-722. The plots of O-832 had variable stands and thus were not harvested. However, leaf analyses for K content was completed and the results presented in Table 4. These data strongly suggest that varieties differ in the K levels maintained in the leaves. It is not known if these differences were due to crop load, root system development, inherent abilities to absorb and/or accumulate higher levels of K, or varietal differences in efficiency of use and/or distribution of K.

TABLE 4. Relationship of variety to levels of K in the leaves of tomatoes, 1985.

	Leaf Content of K (%)							
	Ohio 832				Heinz 722			
Treatment*	7-11	7-26	8-12	Avg.	7-11	7-26	8-12	Avg.
1	2.99	3.49	1.55	2.67	2.15	2.04	1.01	1.73
2	2.24	2.16	1.62	2.00	2.26	1.85	0.84	1.65
3	1.81	3.48	1.61	2.30	2.32	2.54	0.94	1.93
4	2.03	2.06	1.35	1.81	2.26	1.62	1.15	1.68
5	1.56	2.45	1.36	1.78	1.71	1.37	0.93	1.33
6	2.27	2.74	1.47	2.16	2.54	1.88	1.23	1.88
Source of K		7-26	8-12	Avg.		7-26	8-12	Avg.
Potassium nitrate		2.37	1.28	1.83		2.11	1.25	1.68
Potassium sulfate		2.40	1.56	1.98		2.21	1.08	1.64
Potassium chloride		2.97	1.63	2.30		1.94	1.05	1.50

*See Table 1 for precise treatments

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